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Development and emotional evaluation of scented clothing using microcapsules

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Abstract

On today's markets has become increasingly complex since products contain more functions and have to meet increasing demands such as user-friendliness, manufacturability and ecological considerations. Eco-friendly functional apparel finishing for health and amenity using scented material has been applied by micro-encapsulation method. The purpose of this study was to develop complex-functional textiles by sticking cinnamon, pine and lemon scented microcapsules on sports-towel which can be given effect with refresh fragrance features for user' healthy. The microcapsule wall was made from urea-formaldehyde (UF) and scented materials were produced by in-situ polymerization using UF. In the subjective evaluation, scented sports-towel questionnaires consist of 22 items. 204 subjects are first divided into gender blocks before they are randomly assigned group. On the other results of emotional evaluation, using Principle Components Analysis (PCA) for Category Identification and Regression Analysis for Quantification Theory, 5 emotion factors were categorized. Most specific factors correlated moderately with "refreshment" and "eco-friendly" emotion. Special attention is given to the relation between emotional evaluation and "refreshment" of emotion. Furthermore, many studies about the emotional clothing's performance and future ability of the design to increase the value of the emotional connection of the customer would be developed.

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Keywords; Scented clothing; Microencapsulation; Performances of scented microcapsule; Emotional evaluation

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1. Introduction

Recently, “design evolution” is creating the design-focused enterprise, an organization that uses consumer-centered product development to move quickly and effectively from intimate customer knowledge to successful product and service offerings. A large number of manufacturers have started to consider such subjective properties and to develop their products that convey the company image. In the literature on design, product development and innovation, the word “design” refers to many things: a creative art, a phase of product development, a set of functional characteristics, an aesthetic quality, a profession and more. Customers purchase products basing on subjective evaluations such as brand image, reputation, design, impression etc. This demand has triggered the research dealing with the translation of the customer's subjective, hidden needs into concrete products. Nevertheless, consumer-centered emotional design is an emerging best practice in many industries, particularly those characterized by practical apparel products that hold no emotional appeal [2].

With a shortened product lifecycle, development costs are likely to increase. However, success in a certain clothing market not only requires knowledge about the competitors and the performance of competing products, but also about the impressions which a product leaves to the customer. A reliable instrument is therefore needed: an instrument which can predict the reception of a product on the market before the development costs [3].

Among these best practitioners, design is viewed as the art and science of putting all the pieces together: technical, financial, operational and emotional. As most companies already lavish quite a bit of expertise on the technical, financial and operational aspects of what they do, it is the equal focus on the emotional connection with customers that stands out as novel. Further, among such design-focused companies, this newly coequal dimension influences and informs the others, producing new and unexpected results.

The objectives of this study were as follows: to develop and investigate of the transient emotional reactions, there is reason to believe that age may be an important factor in the effectiveness of a given flavour within each age level, and to measure the effectiveness of microencapsulation for scented sports-towel, according to the SEM and particle analyzer, were determined approximately proportioned from microcapsules at chamber-room temperature, and the residue amounts of scented sports-towel after first washing could be measured similar to several times after washing. In addition, we should hope to contribute a little to the overall understanding of the scented apparel of the consumer’s emotion.

2. Literature review

2.1. Emotional design

Emotional Design is both the title of a book by Donald Norman and of the concept it represents. The main topic covered is how emotions have a crucial role in the human ability to understand the world, and how they learn new things. For example: aesthetically pleasing objects appear to the user to be more effective, by virtue of their sensual appeal. This is due to the affinity the user feels for an object that appeals to them, due to the formation of an emotional connection with the object. Norman's approach is based on classical ABC model of attitudes. However, he changed the concept to be suitable for application in design. The three dimensions have new names (visceral, behavioral and reflective level) and partially new content. In the book, Norman shows that design of most objects are perceived on all three levels (dimensions). Therefore a good design should address all three levels: Visceral design- product appearance, behavioral design-usability, and reflective design-self-image (examples; Google: playful or anti-corporate, Apple’s iPod: stylish or avant-garde) [2].

Also, emotional Design has been called hedonic design, affective design, affective human factors design, human-centered design, empathetic design, and focused on the influence of emotions on the way we interact with objects. Industrial design focuses on the target user group in the market, which often excludes users who do not belong to the mainstream. Such users include people who cannot use the mainstream products due to physical, cognitive, cultural, educational, financial obstacles, and other challenges. They have never attracted major industries as the market segment is extremely small for mass production and the marketing is not cost effective.

Contests classic approaches that treat human behavior as ‘stimulus-response’ and consider emotions as noise [2,3].

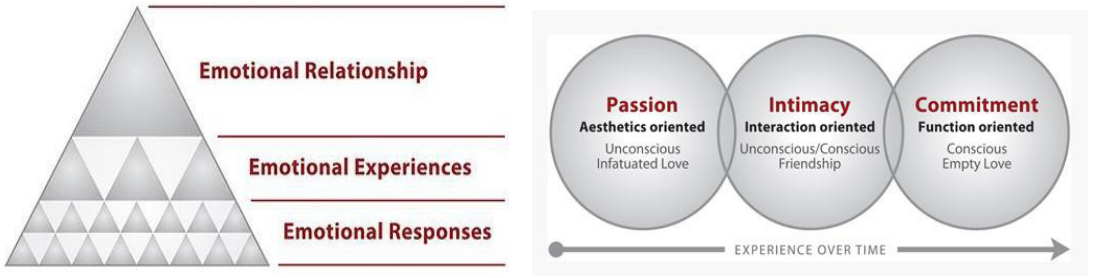

Fig. 1. Emotional design: What Emotional design has in common with love? Source: http://t.co/VPKhoR249d, http://t.co/FDjkBxhfPx.

2.2. How does emotional design relate to usability?

"Frustration, confusion, anger, anxiety and similar emotional states can affect not only the interaction itself, but also productivity, learning, social relationships, and overall well-being". Frustration is doubly troublesome to computer users: they must deal with the source of frustration (the misbehaving computer) and the emotional response: emotional design as an extension to standard usability practices, standard practice: eliminate sources of frustration by addressing them in the design phase, additional practice: make application deal with unavoidable user frustration by addressing the user's emotions, the Media Equation. "Humans readily generalize their expectations from human-human interaction to human-computer interaction regardless of whether or not that is the intent of system designers" [4].

The aspect of emotional design that deals with user frustration can already be considered usability, and so all of the good cost-justifying techniques can be applied hedonistic design is also easy: happier customers buy things, and now for something completely different. Emotional design isn't all sunshine and puppy dogs—someone has to pay the designers and inevitably someone has to convince the money holders that their money is well-spent. An emotionally appealing product can convince users to spend more time learning to use it (e.g., iPod), and paying attention to the emotions of executives in your company can better prepare you to make your case for cost-justifying usability, but it seems like more research needs to be done on the quantitative effects of other emotions before we can address their influence on: productivity, ROI (Return On Investment), social ROI, accessibility [1].

There are a variety of usability evaluation methods. Certain methods use data from users, while others rely on usability experts. There are usability evaluation methods for all stages of design and development, from product definition to final design modifications. When choosing a method, consider cost, time constraints, and appropriateness. Nevertheless, consumer-centered product design is an emerging best practice in many industries, particularly those characterized by practical products that hold no emotional appeal; or in which competition is based on increasingly less profitable attempts to cut cost or improve performance; or where once distinctive products are becoming commoditized; or where there is little room left for product innovation. Among these best practitioners, design is viewed as the art and science of putting all the pieces together — technical, financial, operational and emotional. As most companies already lavish quite a bit of expertise on the technical, financial and operational aspects of what they do, it is the equal focus on the emotional connection with customers that stands out as novel [4,5].

Further, among such design-focused companies, this newly coequal dimension influences and informs the others, producing new and unexpected results. These companies still have strong technology, operations, marketing, research and manufacturing competencies, but these are guided by an organization wide, shared understanding of who their customers are and how the design of their products or services can best shape the customer's experience.

Traditional consumer research — surveys, focus groups and so on — asks people what they want. However, while customers can reliably express their preferences for incremental improvements in existing products and services, they cannot reliably express their higher-order needs and aspirations, which may call for radical redesign or for entirely new offerings. Although these higher-order aspects are what form the basis of a customer's emotional connections to any offering, the customer himself may deem them irrelevant, insignificant or even embarrassing, or

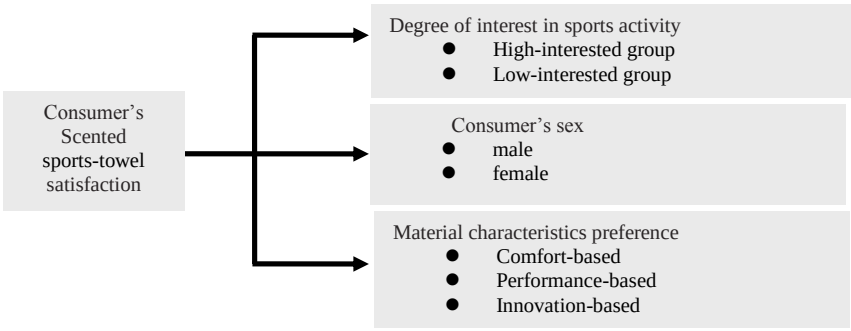

Fig. 2. Diagram of evaluate consumer's sports-towel satisfaction.

may simply not be conscious of them. Design-focused companies, on the other hand, use design research to glean such insights that help guide them to a profitable emotional connection with their customers. In order to effectively communicate the fragrances of commercial perfumes to consumers, it is important to apply congruent colors to their bottles and packaging [6,7].

This research investigated the cross-modal associations between colors and scents through two experiments. The general purpose of this study is to evaluate consumer's sports-towel satisfaction, based on consumer's preference of sports-towel material characteristics in accordance with distinction of sex and a degree of interest in sports activity. The specific objective of this study is as the following:

1. To classify the sports-towel material characteristics in three categories: comfort-based/ performance-based/ innovation-based.
2. To examine the effect of the sports-towel material characteristics preference on consumer's sportswear satisfaction in accordance with consumer's sex.
3. To examine the effect of the sports-towel material characteristics preference on consumer's sportswear satisfaction in accordance with consumer's degree of interest in sports activity.

3. Methodology

This chapter investigates complex-functional textiles by sticking cinnamon, pine and lemon scented microcapsules on sports-towel which can be given effect with refresh fragrance features for user' healthy. The microcapsule wall was made from urea-formaldehyde (UF) and scented materials were produced by in-situ polymerization using UF.

3.1. Specimen and fiber processing with the microcapsules

Microencapsulation for scented fiber processing with the microcapsules is conducted as followings: ① microcapsules (0. 3% soln.), a binder (3% soln.), 20(bath vol.):01(solution) to 10 minutes after immersion the report at room temperature, for 5 minutes at ②80 ℃ drying, heat treatment for 3 minutes at 130 ℃, and then washed with water, and dried to prepare a microcapsule treatment Po (the encapsulated capsule). ③ confirmation of the attachment state of the capsule according to the number of washing; The encapsulating fabric 1, 5, 10, washing 20 times and observed by using an SEM. After then, Antimicrobial measure (1) Measurement of antimicrobial essential oils of cinnamon; Use a paper disk (80mm), confirmed by the agar diffusion method.(2) Measurement of the antimicrobial treatment microcapsules Four; according to the antibacterial and antimicrobial laundry treatment Po is the number of capsules encapsulating fabric 1, 5, 10, 20 times in Launder-o-meter (KOASHOKAI Ltd, Japan) in the use, KS K 0430 A-1 method calculated by measuring the decrease bacteria after washing, and in accordance with the law Shake flask [8].

The test specimens were commercially available cotton (100%) knit. The microencapsulation for scented sports-towel, according to the SEM and particle analyzer, were determined approximately proportioned from microcapsules at chamber-room temperature, and the residue amounts of scented sports-towel after first washing could be measured similar to several times after washing [8].

3.2. Subjective usability evaluation

3.2.1. Subject

In the evaluation of subjective consumer scented sports-towel of, the subjects filled out a post-study questionnaires consisting of 16 subjective emotional questions for each of three scented sports-towels 1(lemon), 2(pine) and 3(cinnamon). Using the Randomized Complete Block design (RCB), we sampled 204 that subjects are from 30 to 60 years within age level.

3.2.2. Experimental procedure and Statistical analysis of the clinical test

So this immediate investigation of the transient emotional reactions, there is reason to believe that age may be an important factor in the effectiveness of a given microencapsulation for scented specimen. Statistical analysis of the clinical test was performed using SPSS 18.0. Subjective usability was evaluated by the factor analysis (PCA). To evaluate and compare wear comfort and usability after smelling the scented sports-towel by survey, 5-point Likert scale data of usability of flavour scents (Likert scale 1; strongly disagree, Likert scale 2; disagree, Likert scale 3; neither agree nor disagree, Likert scale 4; agree, Likert scale 5; strongly agree) were gathered, the questions were chosen 22 wear comfort and usability items by pilot survey.

Usability is often associated with the functionalities of the product (cf. ISO definition, below), in addition to being solely a characteristic of the user interface (cf. framework of system acceptability, also below, which separates usefulness into utility and usability) [5]. Our independent variables were an age and sex, and dependent variables were 3 types of microencapsulation for scented specimen.

4. Results and discussion

4.1. Microencapsulation performance for scented sports-towel

4.1.1. The results of confirmation of prepolymer polymer

Fig.1 is a factor and that showed the FT-IR spectrum of formaldehyde prepolymer, NH peak at 3344 ㎝-1, 1667 ㎝-1 in Ao C = O stretching vibration of the peak, in 2958 ㎝-1 Ao Ao CO NH when seen as a peak of NH sul sul appear, it can be confirmed that the element and the form of the polymer Alte hydroxide.

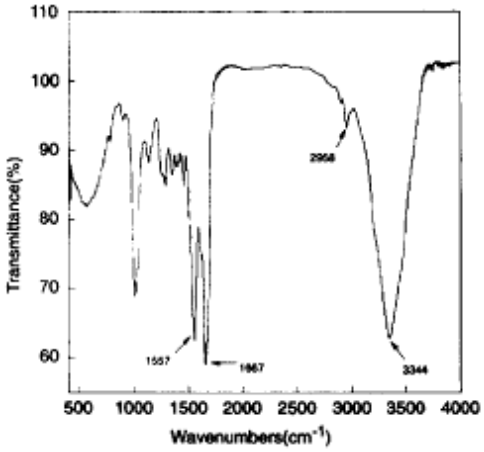

Fig. 3. FT-IR spectrum of urea-formaldehide prepolymer.

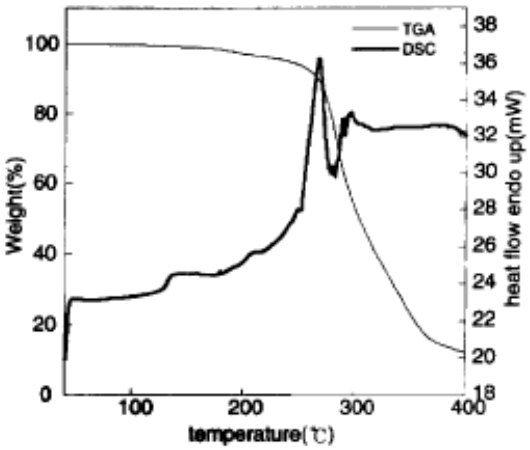

Fig. 4. DSC and TGA thermograms of microcapsule.

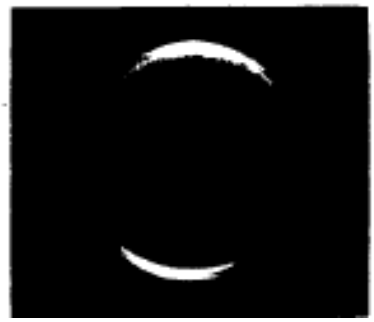

Fig. 5. Antimicrobial properties of the microcapsules of cinnamon oils.

Thermal properties of the microcapsules are TGA, measuring DSC, in Fig.4. TGA curves are the decreased weight gradually up in 180 ℃, 260 ~ 350 ℃, and weight reduction of 70%, the more changes are few; Saenggakdoem to 180 ℃ has excellent durability against heat in the vicinity. DSC curves are Melting at 260 ℃, the peak point of the fracture which due to the destruction of the capsule wall material core material is released to the outside.

Antimicrobial properties of the microcapsules show in Table 2. First, cinnamon antimicrobial essential oils; Fig.5 (Hallo-Test Results), the width of the sterile zone show 10mm, cinnamon essential oil used in the present study confirm the superior antibacterial effect. Second, antimicrobial treatment of microcapsules included (Table 2); the results of antimicrobial change due to washing: Japan Textile Products Sanitary Processing Conference; This is when the bacteria antimicrobial reduction is equal to or greater than 26%: encapsulated antimicrobial at least 94% compared to untreated; excellent durability.

Table 1. The effect of Antimicrobial properties on laundering cycle.

laundering cycle	Antimicrobial activity (%)
	capsule
none	94
1	91
5	75
10	51
20	32

4.2. Result of subjective usability evaluation

4.2.1. Factor analysis results of subjective usability of scented sports-towel

Factor analysis results of subjective usability of scented sports-towel were named them respectively (1) “refreshment”, (2) “eco-friendly”, (3) “romantic”, (4) “intensity”, (5) “esthetics”. The all ‘eigen value’s of the 5 factors were above 1.0, and showed as “refreshment”(3.522%), “eco-friendly” (2.035%), “romantic”(1.702%), “intensity”(1.609%), “esthetics”(1.595%).

Flavor and design preferences can be viewed as being selected according to individual preference by experience, learning, and environmental factors. 3 lemon, pine needles, subject sensibility evaluation of cinnamon sports towel with respect to the preferred direction of their choice are product aesthetics, individuality (distinctiveness), femininity-masculinity, strength and positive emotions in the emotional evaluation of spontaneous items may be showed as Table 2.

Table 2. Factor analysis results of overall subjective usability of 3 oil types scented sports-towel.

	Emotional Factor of scented sports-towel						
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	variation	Cronbach α
subjective usability questionnaires	refreshment	eco-friendly	romantic	intensity	esthetics		
young	.857	.001	.145	.032	.067	762	.818
light	.734	.116	.139	.167	.115	.613	
actual	.717	.142	.025	-.225	-.244	.645	
fresh	.710	-.056	.000	.037	.146	.530	
clean	.605	.344	.048	-.397	.095	.654	
neat	.601	.108	.070	.155	-.030	.403	
natural	.128	.819	-.013	.152	.043	.712	.724
distinctive	-.073	.761	.015	.070	.382	.735	
chic	.543	.665	.048	-.092	.057	.752	
feminine	.247	-.101	.814	-.172	.023	.764	.620
warm	-.029	.010	.798	.138	.071	.661	
weak	.205	.278	.556	.076	-.405	.598	
vivid	-.030	.153	.161	.813	.024	.712	.544
individual	.170	.022	-.129	.753	.239	.670	
luxurious	-.030	.130	.025	.152	.827	.725	.494
aromatic	.222	.219	-.012	.070	.652	.528	
DISPERSION (%)	22.011	12.717	10.635	10.058	9.971		
ACCUMULATIVE VARIATION (%)	22.011	34.729	45.363	55.422	65.393		
EIGEN VALUE	3.522	2.035	1.702	1.609	1.595		

5. Conclusion

This study was obtained functional clothing (cotton knit) gave a direction to release the microencapsulated fragrance antibacterial and certain spices at the same time, certain spices with antimicrobial and direction (Lemon flavor, Chacharia direction) with a micro-encapsulated cotton knit the sensitivity function was developed materials. And the like is excellent in the microcapsules adhered to the fiber thermal stability and optimum washing conditions

in the microencapsulation process, which may have the durability and economical efficiency of the stirring rate and dispersant concentration was proposed I is significant.

Olfactory sensitivity is an important emotion in human life, in the use of incense Beyond simply entertaining the mood is used for the purpose of treatment is referred to it aromatheraphy. The cinnamon is in terms of its scent is inhaled through the mucous membrane sterilization, disinfection, relieve pain and aroma therapeutic properties of the nose resulting in a change in vital signs, such as to stimulate brain waves, and by eliminating the effect of depression and also used as a disinfectant, cinnamon essential oil microcapsules treated cotton knit clothing material is thought to La granted the functionality and sensitivity of antimicrobial and directions at the same time.

As a results of this research, referring to the "emotional engineering evaluation of the direction of processing textile products" for the subjective assessment of functional status in the sample; After rubbing the frequency and subjective evaluation methods for face washing, and also the individual age, gender, life experiences, and social characteristics, such as taste preference for flavor may differ depending on various factors, selecting a fragrance with a functionality similar to the cinnamon essential oil and is also thought to be a subjective evaluation of the sensitivity of different flavor.

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